DOE/NSF Project Manager's Quarterly Progress Report
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through **December 31, 1999**
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	T. Toohig, (301) 903-4115, timothy.toohig@science.doe.gov
DOE/NSF Associate Program Manager:	M. Goldberg, (703) 306-1894, mgoldber@nsf.gov
Operations Office:	Chicago Operations Office/Fermi Group
DOE/NSF Project Manager:	J. Yeck, (630) 840-2530, jim.yeck@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html

LHC Project - http://wwwlhc.cern.ch/	U.S. LHC Accelerator - http://www-td.fnal.gov/
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html	U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html	U.S. CMS - http://uscms.fnal.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

A listing of current project reviews and status meetings is shown below:

Project	Event	Date
U.S. ATLAS	Quarterly Status Meeting	December 20, 1999
U.S. LHC Accelerator	Quarterly Status Meeting	January 25, 2000
U.S. ATLAS	DOE/NSF Review	February 28-March 2, 2000
U.S. CMS	DOE/NSF Review	April 11-13, 2000
U.S. LHC Accelerator	DOE/NSF Review	May 16-17, 2000

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports to DOE/NSF and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized below.

Table 3.1, Cost & Schedule Performance (in thousands of dollars)

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	34,992	26,189	23,450	-8,803	2,739	163,750	163,750	0
U.S. CMS	59,853	51,121	53,900	-8,732	-2,779	167,250	167,250	0
U.S. LHC Accelerator	41,339	37,710	37,858	-3,629	-148	110,000	110,000	0
CERN Invoices	9,836	9,836	9,836	0	0	90,000	90,000	0
U.S. LHC Total	146,020	124,856	125,044	-21,164	-188	531,000	531,000	0

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	120,560	43,190	26,189	94,371	46%
US CMS	167,250	124,396	42,854	51,121	73,275	58%
US Accelerator	110,000	94,232	15,768	41,339	52,893	30%

Table 3.3, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	29%	22%	76%
U.S. CMS	48%	41%	85%
U.S. LHC Accelerator	44%	40%	91%

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost - Cost performance is good as material contracts are typically below estimates and labor costs are tracking close to plans. Project reviews and reports confirm that each project has adequate contingency available. The detector projects are in the production phase and cost experience on production labor will be an important future indicator of cost performance.

Schedule - Schedule performance is measured through milestone completion and by earned value. These measurements indicate that schedule progress is behind plans averaging about eighty-five percent of the baseline plan. CERN expects to complete construction of the LHC and commence initial operations in 2005. The U.S. schedules are consistent with this goal.

Technical - We remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. ATLAS, CMS, and LHC Accelerator project's deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We hope to provide additional items to CERN, within the approved funding, should cost performance be favorable.

ISSUES

LHC Schedules - Delays in critical path activities for the LHC machine and the major experiments indicate a potential delay in the completion of the LHC and the start of data-taking beyond 2005. CERN maintains that the July 2005 completion date is still viable but commits to evaluating the schedule prior to the December 2000 CERN Council meeting. There is increasing speculation that the new schedule will acknowledge some delay in project completion and possibly introduce staging plans for the experiments. DOE and NSF staff are considering actions necessary to mitigate the impacts of a delay.

ATLAS and CMS Integration – The resources available for ATLAS and CMS integration are believed to be insufficient to meet schedule and technical assurance requirements. This issue was originally raised due to concerns with the level of ATLAS centralized engineering. DOE and NSF staff have brought this issue to the attention of CERN management.

Radiation Hard Electronics - Although there has been technical progress in the development of radiation hard electronics for the ATLAS and CMS experiments, significant challenges remain including production yields and the viability/interest of current vendors. Export license and dual-use technology issues are additional complications.

Russian Collaborators - Russian collaborators are not able to meet all of their original commitments to the ATLAS and CMS collaborations. ATLAS and CMS management continue to address shortfalls from Russian and other collaborators when schedules dictate. U.S. CMS has accepted additional responsibilities for the hadron calorimeter tasks in order to hold schedule.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International – The ATLAS Spokesperson, Peter Jenni, addressed the status of the overall ATLAS experiment at the October ATLAS Resource Review Board meeting and at the LHC Experiments Committee meeting in December. The Spokesperson indicates that there a number of areas where the schedules are now critical and corrective action is necessary. Noteworthy items are summarized below:

- The barrel toroid magnet is technically challenging and significantly behind schedule. There are important technical choices that must be made to avoid future delays.
- The liquid argon system has also experienced several schedule delays and is now receiving increased attention from the ATLAS Technical Coordination Group and CERN.
- The cash flow from the Russian government is below agreed values but ATLAS continues to find ways to avoid delays.
- ATLAS civil construction work is behind schedule due to adverse soil conditions.

U.S. ATLAS - A DOE/NSF Quarterly Status Meeting was held in December 1999, at Harvard University. The project is making is now 22% complete. While there is good technical progress on all fronts, schedule progress is behind plan and there are delays in the start of production factories for the Muon system and the Transition Radiation Tracker. Noteworthy items are summarized below:

- Radiation hard electronics is a critical issue for the **Silicon Strip and Pixel** detectors. Mechanics is progressing well. This is an ambitious and diverse subsystem that pushes the frontier of technology more than any other detector in ATLAS. Additional iterations of the designs/prototypes of the microelectronics are required.
- The start of production at the **Transition Radiation Tracker** university sites is delayed. Production will begin soon and rate production should be demonstrated by fall.
- The **Liquid Argon Electromagnetic Calorimeter** continues to show very good progress on the barrel cryostat. The readout electrodes are under contract with increased management attention by the ATLAS technical coordinator and CERN management.
- The submodule production rates for the **Tile Hadronic Calorimeter** are quite favorable with three sites in production. Production delays on the Gap submodule are a concern and efforts are underway to accelerate this work so that it does not delay module assembly.
- The **Muon Tracking** detector is behind schedule due to delays in the start of production of the muon drift tubes. The tubes will be fabricated at Harvard, Michigan, and Washington universities. Production starts are expected in the next few months.
- **Trigger/Data Acquisition** continues to make steady R&D progress.

5.2 U.S. CMS CONSTRUCTION PROJECT

CMS International - The CMS Spokesperson, Michel Della Negra, presented CMS status at the Resource Review Board meeting in October and at the LHC Experiments Committee meeting in December. Noteworthy items are summarized below:

- There is good progress on the solenoid magnet with some delay in coil winding.
- The collaboration has approved a new strategy for the central tracker that avoids staging. This strategy eliminates the micro-strip gas chambers (MSGCs) and relies entirely on silicon layers.
- CMS has evaluated the risk of funding shortfalls from collaborating countries including Russia. Current estimates project about 17 million Swiss Francs in deliverable value corresponding to about 30 million dollars in U.S. accounting, i.e., including labor. The collaboration is developing contingency plans for addressing the projected shortfall.
- CMS is defining a global plan for matching scope to the available resources.

U.S. CMS - A DOE/NSF Quarterly Status meeting was held in November 1999. The U.S. CMS project is making good progress and is 41% complete. The relatively high completion percentage at this early stage in the project is due primarily to the success placing contracts for 100% of the U.S. commitments to CMS common projects ($23 million). Noteworthy items are summarized below:

- The **Hadron Calorimeter (HCAL)** barrel brass absorber and scintillator tiles are on schedule. There was an engineering design review for the forward calorimeter held in December 1999. The review authorized the second pre-production prototype to be delivered to CERN for tests in May, 2000.
- Pre-production versions of the Cathode Strip Chambers for the **Endcap Muon** system have been successfully tested at the LHC luminosity rates in the CERN Gamma Irradiation Facility. The production start for the chambers is delayed but should begin this summer ar Fermilab.
- 1000 avalanche photodiodes from Hamamatsu for the **Electromagnetic Calorimeter** were received, tested, and characterized. Problems with radiation hardness are being addressed through work on an alternative design.
- The **Trigger/Data Acquisition System** Application Specific Integrated Circuit (ASIC) submissions for the calorimeter are in progress. The muon trigger has been redesigned.
- A readout chip setup for the **Forward Pixels** is in operation at Fermilab.
- All U.S. responsibilities for CMS **Common Projects** are under contract as Fermilab awarded the final contracts for aluminum stabilizer and bulk aluminum. Deliveries are underway and the first 1400-ton barrel yoke ring is complete.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC - CERN is maintaining the July 2005 turn on date for the machine. Interim milestones are routinely met but there is essentially no schedule float. Delays in civil construction work require the development of work around plans.

U.S. LHC Accelerator - The project is making good progress and is approximately 40% complete. Noteworthy items are summarized below:

Interaction Region (IR) Quadrupoles

- Short model phase 1 milestone completed. Recent models were very successful with adequate quench and magnetic field quality performance.
- Heat exchanger test units delivered to Fermilab and prepared for shipment to CERN.
- KEK schedules are consistent with Fermilab/CERN requirements.

Interaction Region and RF Region Dipoles

- The first 3-meter prototype magnet was produced and successfully completed quench performance tests.
- Most of the parts are ordered for production magnets.
- There has been good progress on documentation and resolution of specification and interface issues but more effort is required.

IR Feedboxes and Absorbers

- Feedbox detailed design work is well underway and Absorber design work continues.
- Functional specification for IR absorbers submitted to CERN for approval.

Superconducting Cable Testing and Production Support

- Completed upgrades to the superconductor test facility at BNL. First pre-production samples were delivered by CERN to BNL. These samples continue to arrive and the facility managers anxiously await production samples.
- Completed delivery of all promised cable measurement equipment to CERN.

Accelerator Physics

- Interaction Region Alignment Workshop (Fermilab, October 1999) resulted in full discussion by all relevant parties (US, CERN, KEK).

CERN Direct Purchases - DOE reimburses CERN for their payments to U.S. vendors [ref. U.S.-CERN Agreement and Accelerator Protocol]. The status is shown in the following table.

Table 5.1, Status of DOE Payments (in $000)

Contract Item	U.S. Company	Amount Paid	Contract Value Est.	w/ Escalation
Niobium-titanium alloy bars and niobium sheets - two contracts	Wah Chang	8,685	44,333	46,500
Dipole outerlayer and quadrupole superconducting cable [587 km]	IGC Advanced Superconductors	1,151	16,491	17,500
Totals		9,836	60,824	64,000

6. FINANCIAL/COST STATUS AND PLANS

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)*

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	Total
Machine Funding Profiles (DOE)											
US LHC	2.00	6.67	14.00	15.40	20.10	17.80	17.00	10.20	6.83	0.00	110.00
CERN Direct	0.00	0.00	0.00	8.09	13.11	18.50	14.20	18.80	17.30	0.00	90.00
Machine Total	2.00	6.67	14.00	23.49	33.21	36.30	31.20	29.00	24.13	0.00	200.00
Detector Funding Profiles (DOE and NSF)											
US ATLAS	1.70	3.71	10.05	25.63	28.43	28.80	27.85	22.89	14.69	0.00	163.75
DOE	1.70	3.71	10.05	9.00	16.49	16.51	15.20	15.60	14.69	0.00	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	60.80
US CMS	2.30	4.62	10.95	38.03	24.26	21.27	27.81	22.83	15.18	0.00	167.25
DOE	2.30	4.62	10.95	32.51	20.30	17.19	23.60	20.40	15.18	0.00	147.05
NSF	0.00	0.00	0.00	5.52	3.96	4.08	4.21	2.43	0.00	0.00	20.20
Detectors Total	4.00	8.33	21.00	63.66	52.69	50.07	55.66	45.72	29.87	0.00	331.00

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)†

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Commitments	D= B+C Total	A–D = Funds Available
U.S. ATLAS	69,520	23,450	3,745	27,195	42,325
U.S. CMS	80,160	53,900	2,228	56,128	24,032
U.S. LHC Accelerator	58,170	35,649	1,686	37,335	20,835
CERN Direct Purchases	21,200	9,836	0	9,836	11,364
Total	229,050	122,835	7,659	130,494	98,556

* The annual funding distribution between projects is subject to change.

† Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal year.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS No.	Description	Previous	Change	Current
1.1	Silicon System	17,927		17,927
1.2	Transition Radiation Tracker	8,187		8,187
1.3	Liquid Argon Calorimeter	35,241		35,241
1.4	Tile Calorimeter	6,843		6,843
1.5	Muon Spectrometer	19,835		19,835
1.6	Trigger/Data Acquisition System	15,211		15,211
1.7	Common Projects	9,179		9,179
1.8	Education	286		286
1.9	Project Management	7,339	440	7,779
	Contingency	43,702	-440	43,262
	U.S. ATLAS Total Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS No.	Description	Previous	Change	Current
1.1	Endcap Muon	31,984	26	32,010
1.2	Hadron Calorimeter	33,050	2,677	35,727
1.3	Trigger and Data Acquisition	13,315	210	13,525
1.4	Electromagnetic Calorimeter	8,640	177	8,817
1.5	Forward Pixels	6,049	52	6,101
1.6	Common Projects	23,992	-992	23,000
1.7	Project Office	7,365	-2,197	5,168
1.8	Silicon (new WBS element)	0	0	0
	Contingency	42,855	47	42,902
	U.S. CMS Total Cost Baseline	167,250	0	167,250

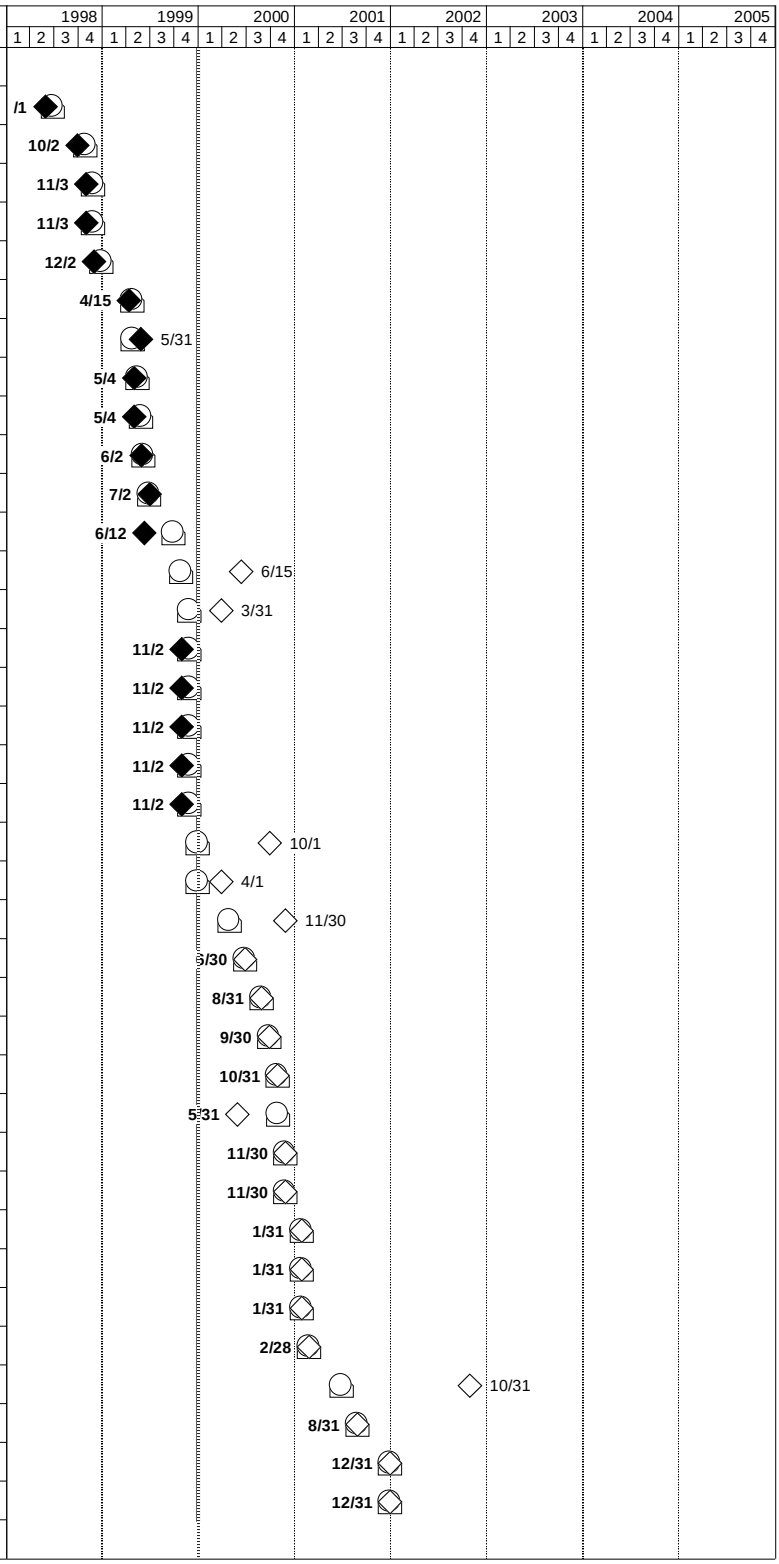
U.S. LHC Accelerator Cost Baseline

WBS No.	Description	Previous	Change	Current
1.1	Interaction Region Components	48,850	375	49,225
1.2	Radio Frequency Straight Section	13,493		13,493
1.3	Superconducting Wire and Cable	11,352		11,352
1.4	Accelerator Physics	4,925		4,925
1.5	Project Management	15,291		15,291
	Contingency	16,089	-375	15,714
	U.S. LHC Accelerator Total Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

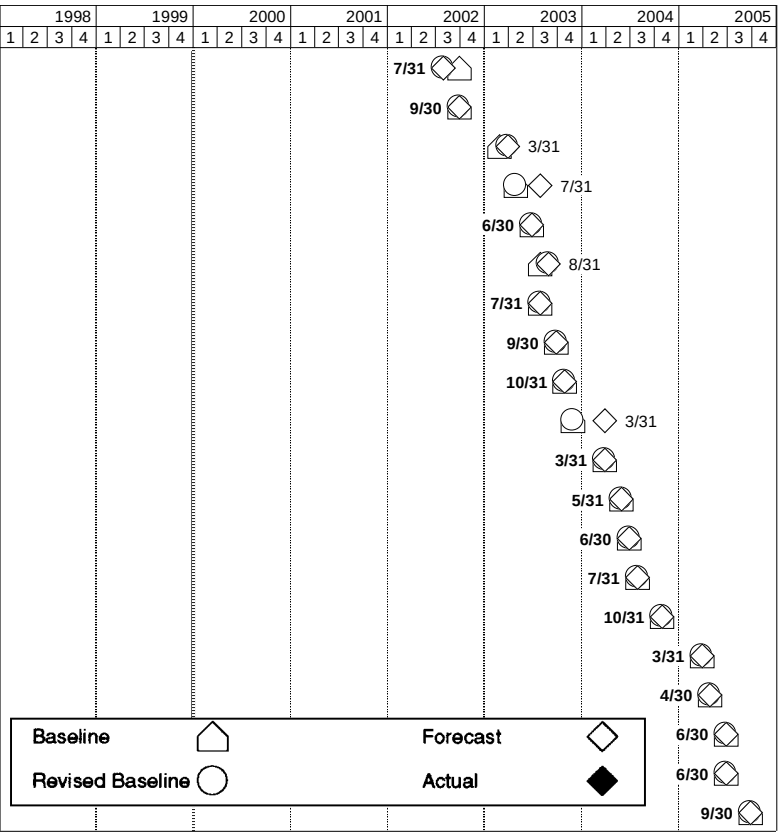
U.S. CMS Milestones

ID	Milestone	Variance
	Project Start (10/31/95)	0 days
ECAL	Choice of Avalanche Photodiodes	-21 days
HCAL	HB: PP1 Absorber Delivered to CERN	-21 days
HCAL	HB: Mechanical Engineering Design Review	-19 days
TRIG	Complete Initial Muon, Cal., & Global Trigger Design	-19 days
MUON	Mechanical Engineering Design Review	-21 days
HCAL	HB: PPP2 Absorber Delivered to CERN	-9 days
MUON	Begin Production of Cathode Strip Chamber Panels	21 days
DAQ	Design of Readout Unit Prototype 2 Complete	-10 days
DAQ	Event Builder Prototype 1 Complete	-19 days
HCAL	HO Engineering Design Review	-4 days
FPIX	Remaining Milestones up to 2005	1 day
HCAL	HE Mechanical Engineering Design Review	-78 days
MUON	Begin Assembly of Cathode Strip Chambers at FNAL	163 days
MUON	Pre-production App.-Spec.-Integrated Circuits Ready	88 days
TRIG	Complete Phase 1 Prototype Design	-20 days
DAQ	Readout Unit Prototype 2 Complete	-20 days
DAQ	Filter Unit Prototype 1 Complete	-20 days
DAQ	Vertical DAQ Chain Prototype Complete	-20 days
DAQ	High Level Trigger Prototype 1 Complete	-20 days
ECAL	500 Electronics Channels Test	196 days
ECAL	Module (400 channels) Prototype	66 days
DAQ	Full DAQ Prototype Tests Complete	153 days
ECAL	Super-module 1 Completed	0 days
MUON	Begin Mass Production of Electronics Boards	0 days
MUON	Begin Mounting Electronics and Testing at UCLA/UF	0 days
HCAL	HF Engineering Design Review Complete	0 days
DAQ	Technologies Choice Preparation	-110 days
HCAL	HB-1 Absorber Delivered to CERN	0 days
CMS1	Submit Trigger Technical Design Report (TDR)	0 days
FPIX	Final Full Size Sensors Submission	0 days
HCAL	HF: Define Fiber Diameter	0 days
MUON	Begin CSC Assembly-PNPI (Russia) & IHEP (China)	0 days
FPIX	Final Full Size Readout Chip Submission	0 days
HCAL	Complete Front-end Electronics Production	348 days
ECAL	Super-module 1 Calibration	0 days
CMS1	Submit Data Acquisition System TDR	0 days
HCAL	HB+1 Absorber Delivered to CERN	0 days



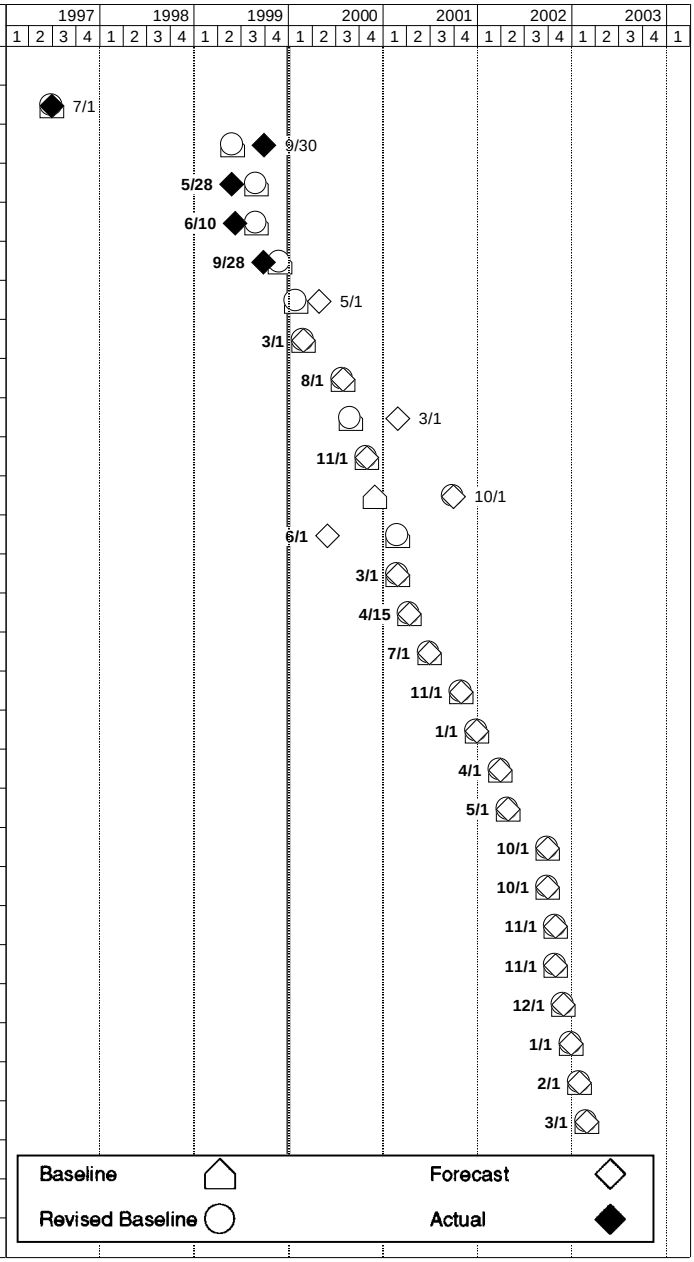
U.S. CMS Milestones (continued)

ID	Milestone	Variance
CMS1	End Assembly of HB (barrel) in Surface Hall (SX5)	0 days
ECAL	Half-barrel (18 super-modules) calibrated	0 days
CMS1	End Assembly of HE (endcap) in SX5	0 days
CMS1	End Trial Insertion of HB in Vacuum Tank	65 days
HCAL	HO Optics Installation on YB Completed	0 days
CMS1	Trial Mounting ECAL-barrel Super-module on HB	0 days
MUON	Install One-half of the Chambers	0 days
CMS1	Close Yoke and Start Magnet Test in SX5	0 days
MUON	All Large Chambers Assembled and Tested	0 days
HCAL	HB: End Installation in Solenoid in UX5	87 days
MUON	All Chambers Installed	0 days
CMS1	End Installation and Test of HB in UX5	0 days
ECAL	Full-barrel (36 super-modules) calibrated	0 days
CMS1	End Installation and Test of HE in UX5	0 days
CMS1	End Inst., Testing, & Debug. of EB (barrel) in UX5	0 days
CMS1	End Install. of ME (endcap) Stations in YE in UX5	0 days
HCAL	HO End Installation and Tests in UX5	0 days
CMS1	End Installation and Test of Tracker in UX5	0 days
CMS1	End Installation and Test of HF in UX5	0 days
	Project Completion (9/30/05)	0 days



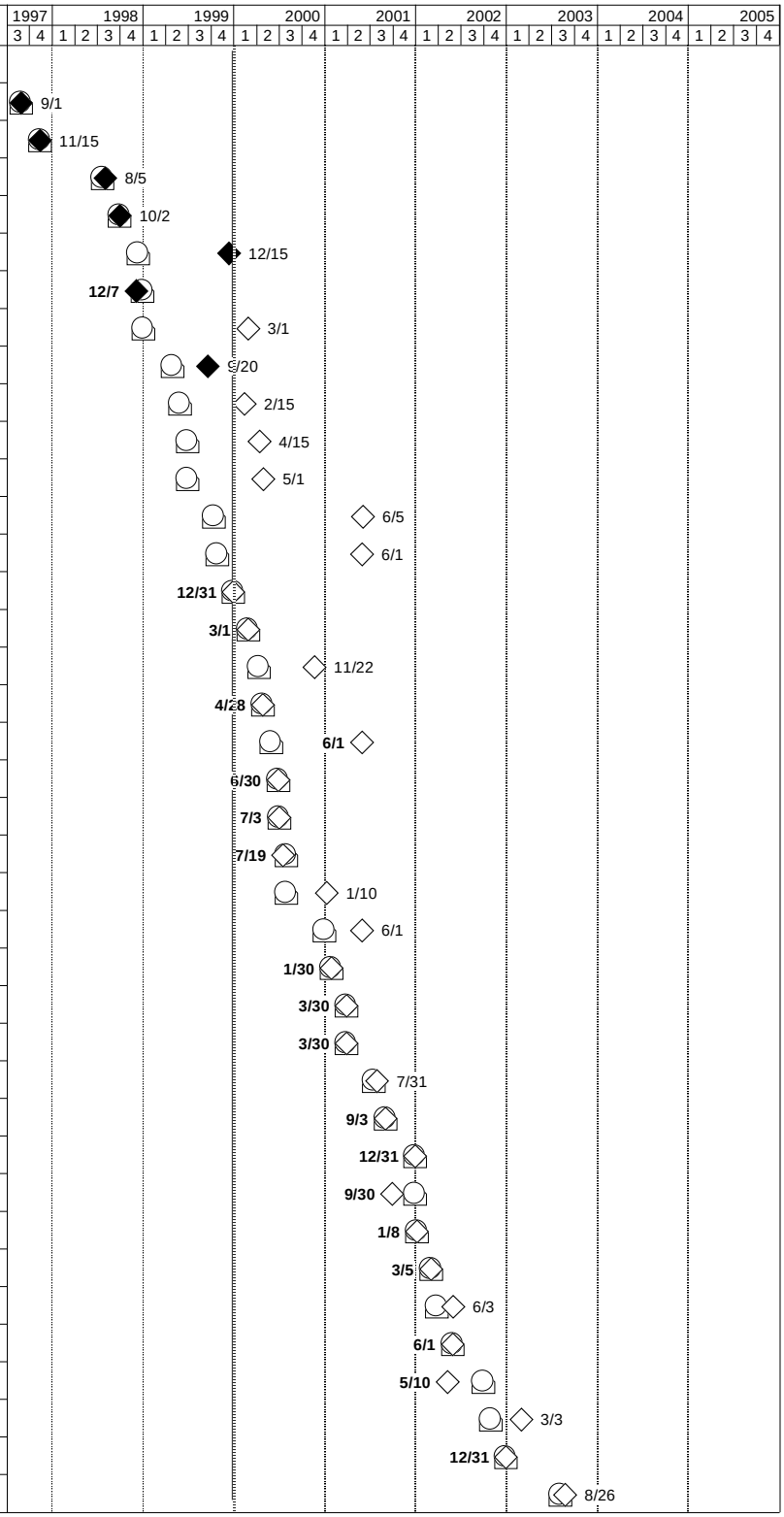
U.S. LHC Accelerator Milestones

ID	Milestone	Variance
	Project Start (10/1/95)	0 days
IR	Begin 1st Inner Triplet Quadrupole Model Magnet	0 days
SC	Complete Superconductor Test Facility Upgrades	87 days
SC	All Cable Production Support Equipment Delivered to CERN	-68 days
RF	Begin Assembly of 1st Dipole Model Magnet	-59 days
IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 1	-46 days
IR	Place Purchase Order for HTS Pow er Leads	64 days
IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	0 days
RF	Complete Dipole Model Magnet Program	0 days
RF	Begin RF Region Dipole Production Assembly	129 days
IR	Begin Absorber Fabrication	0 days
IR	Complete Inner Triplet Quadrupole Prototype Magnet Program	0 days
IR	Begin Interaction Region Beam Separation Dipole Prod. Assembly	-195 days
IR	Begin Inner Triplet Feedbox Fabrication	0 days
IR	Begin Inner Triplet Quadrupole Production Assembly	0 days
RF	Decision on RF Region Quadrupoles	0 days
IR	Complete 1st Inner Triplet Quadrupole Magnet	0 days
RF	Delivery of D3, D4 for IR4 right	0 days
IR	Delivery of D2 for IR8 Left	0 days
IR	Complete Inner Triplet Feedbox Fabrication	0 days
IR	Delivery of All Inner Triplet System Components for IR8 Left (MQX, DFB	0 days
RF	Complete RF Region Dipole Production Assembly	0 days
IR	Delivery of D2 for IR5 Left	0 days
RF	Delivery of D3, D4 for IR4 left	0 days
IR	Complete Absorber Fabrication	0 days
IR	Delivery of All Inner Triplet System Components for IR8 Right (MQX, DFI	0 days
IR	Delivery of D2 for IR8 Right	0 days
IR	Complete Interaction Region Dipole Production Assembly	0 days
	Project Completion (9/30/05)	0 days



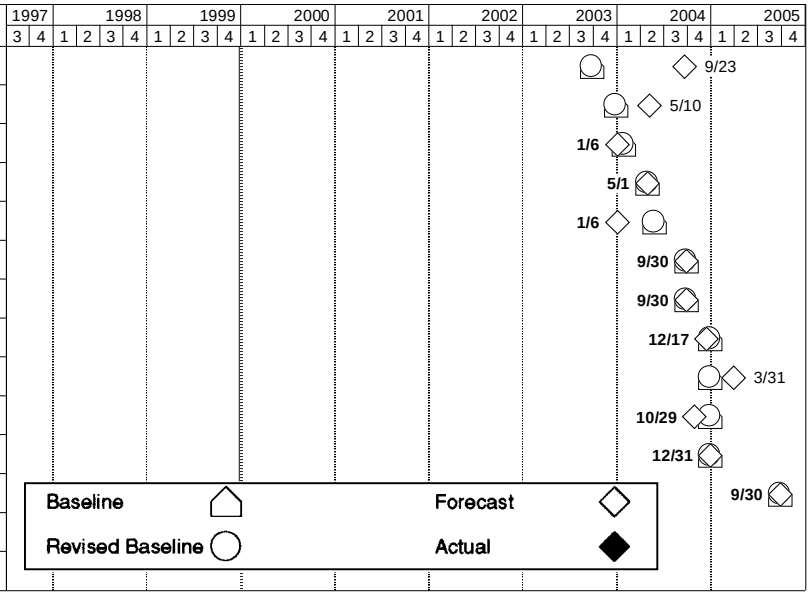
U.S. ATLAS Milestones

ID	Milestone	Variance
	Project Start (10/1/95)	0 days
Tile	Start Submodule Procurement	0 days
Tile	Technology Choice for F/E Electronics	0 days
Lar	Cryostat Contract Award	8 days
Lar	Barrel Feedthroughs Final Design Review	2 days
Lar	FCAL Mechanical Design Complete	262 days
TRT	Final Design Complete	-18 days
Muon	Start MDT Chambers Lines 1 and 3	302 days
Tile	Start Module Construction	100 days
Lar	Start Electronics Production (Preamps)	185 days
Muon	Start CSC Chamber Production	207 days
Tile	Start Production of Motherboards & Digitizer Boards	216 days
SIL	Start Full Strip Module Production	427 days
Muon	ASD Chip Design Complete	415 days
TDAQ	Select Final LVL2 Architecture	0 days
Lar	Level 1 Trigger Final Design Complete	0 days
SIL	ROD Design Complete	158 days
Muon	Final Design of Global Alignment Devices Complete	0 days
Lar	ROD Final Design Complete	261 days
Muon	CSC IC Production Complete	0 days
Lar	FEB SCA Prod. Chip Submission/Contract Award	0 days
TRT	Select Final Elec Design	-8 days
TRT	Start Production	117 days
Lar	Motherboard System Production Complete	109 days
Muon	Kinematic Mount Design Complete	0 days
SIL	Start Full Silicon Strip Electronics Production	0 days
Lar	Cryostat Arrives at CERN	0 days
Lar	Barrel Feedthroughs Production Complete	9 days
Lar	FCAL-C Delivered to EC	0 days
TDAQ	LVL2 Trigger Design Complete	0 days
TDAQ	LVL2 Trigger Prototype Complete	-65 days
TDAQ	Start Production	0 days
TDAQ	Start Installation & Commissioning	0 days
TRT	Module Production Complete	46 days
Tile	Start Installation at CERN	0 days
Tile	Module Construction Complete	-102 days
Lar	FCAL-A Delivered to EC	86 days
TRT	Barrel Construction Complete	0 days
SIL	Complete Shipment of Silicon Strip Module Production	12 days



U.S. ATLAS Milestones (continued)

ID	Milestone	Variance
Muon	MDT Chambers (U.S.) Production Complete	257 days
Muon	Kinematic Mount Production Complete	93 days
Muon	ROD Production Complete	-18 days
Tile	Installation at CERN Complete	0 days
Muon	MDT Off-Chamber Electronics Production Complete	-103 days
SIL	ROD Installation/Final Commissioning Complete	0 days
TRT	Installation Complete	0 days
Muon	CSC Assembly/Testing at CERN Complete	-10 days
Muon	Global Alignment Final Assembly/Checkout Complete	64 days
TDAQ	Production Complete	-45 days
TDAQ	LVL2 Installation & Commissioning Complete	0 days
	Project Completion (9/30/05)	0 days



9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was approved by the JOG in March 1998. Deliverables are listed in the U.S. ATLAS Construction Project Management Plan, Appendix 3.

U.S. CMS Construction Project - No change. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was approved by the JOG in October 1998. The scope of U.S. CMS contribution is described in the U.S. CMS Management Plan, Appendix 2.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement to the Accelerator Protocol. The Implementing Arrangement was signed by the CERN and U.S. signatories in July 1998. Reference the U.S. LHC Accelerator Project Management Plan, Annex II, (Approved 6/15/98).

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No changes this quarter
Level 2, DOE/NSF Project Office	
U.S. ATLAS	Three changes this quarter.
U.S. CMS	Numerous changes this quarter.
U.S. LHC Accelerator	Two changes this quarter.

U.S. ATLAS – A total of three Level 2 changes were approved this quarter. The only cost change addressed the addition of mechanical/electromechanical integration support to the Project Office (Section 7 above). Schedule changes are shown in Section 8.

U.S. CMS – There were changes to each Level 2 cost baseline element this quarter (Section 7 above). The most significant cost changes were the transfer the HE brass procurement (transfer from the Project Office to HCAL) and changes in Common Projects to "as-year" dollars. A new WBS element was added, WBS 1.8, Silicon, to address a change in scope. Fermilab will produce elements of the CMS inner tracker at no cost to the U.S. In addition there were numerous changes to the Level 2 schedule milestones to reflect the CMS official schedule (Section 8).

U.S. LHC Accelerator – There were two changes this quarter as noted resulting in a net use of contingency of $375,000.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. ATLAS Construction Project

	FY 1998				FY 1999				FY 2000				
	DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
ANL	0	1,098	0	1,098	0	967	0	967	0	1,283	0	1,283	3,348
BNL	0	3,903	0	3,903	0	2,581	0	2,581	0	6,429	0	6,429	12,913
LBNL	0	633	0	633	0	715	0	715	0	420	0	420	1,768
SUNY/Albany	20	0	0	20	48	0	0	48	0	0	0	0	68
U. of Arizona	320	100	0	420	634	0	0	634	557	0	0	557	1,611
Boston U.	224	0	0	224	298	0	0	298	287	0	0	287	809
Brandeis U.	265	45	0	310	0	0	593	593	0	0	0	0	903
U.C.Irvine	193	0	0	193	0	0	93	93	0	0	0	0	286
U.C. SantaCruz	404	0	0	404	63	0	0	63	0	0	0	0	467
U. of Chicago	0	54	0	54	0	0	1,069	1,069	0	0	0	0	1,123
Duke U.	190	0	0	190	601	0	0	601	417	0	0	417	1,208
Hampton U.	0	0	0	0	0	0	538	538	0	0	293	293	831
Harvard	234	0	0	234	0	0	654	654	0	0	0	0	888
U. of Illinois	50	159	0	209	347	0	0	347	0	0	0	0	556
Indiana U.	190	0	0	190	765	0	0	765	460	0	0	460	1,415
MIT	50	0	0	50	105	0	0	105	0	0	0	0	155
Michigan State	0	35	0	35	0	0	178	178	177	0	0	177	390
Nevis/Columbia	0	675	0	675	0	0	2,680	2,680	0	0	0	0	3,355
U. of New Mex.	20	0	0	20	30	0	0	30	0	0	0	0	50
Northern Illinois	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohio State U.	0	0	0	0	100	0	0	100	45	0	0	45	145
U. of Michigan	62	254	0	316	716	0	0	716	518	0	0	518	1,550
U. of Oklahoma	30	0	0	30	0	0	41	41	0	0	0	0	71
U. of Penn.	250	0	0	250	300	0	0	300	0	0	0	0	550
U. of Pittsburg	110	0	0	110	0	0	150	150	0	0	0	0	260
U. of Rochester	0	0	0	0	0	0	3,587	3,587	0	0	0	0	3,587
U.T. Arlington	50	82	0	132	0	0	474	474	0	0	0	0	606
S. Methodist	40	0	0	40	124	0	0	124	30	0	0	30	194
SUNY/Stony B.	27	0	0	27	0	0	1,045	1,045	0	0	0	0	1,072
Tufts University	50	0	0	50	20	0	0	20	0	0	0	0	70
U. Washington	0	0	0	0	0	0	240	240	0	0	0	0	240
U. of Wisconsin	230	0	0	230	429	0	0	429	665	0	0	665	1,324
Subtotal	3,009	7,038	0	10,047	4,580	4,263	11,342	20,185	3,156	8,132	293	11,581	41,813
Reserve	0	3	0	3	157	0	5,289	5,446	960	4,247	11,647	16,854	16,854
Total	3,009	7,041	0	10,050	4,737	4,263	16,631	25,631	4,116	12,379	11,940	28,435	58,667

Project Manager's Quarterly Progress Report
1st Quarter FY 2000

U.S. CMS Construction Project

	FY 1998				FY 1999				FY 2000				
	DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,073	0	5,073	21,447
Fairfield	0	29	0	29	0	0	0	0	0	0	0	0	29
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	668
Boston U.	0	32	0	32	31	111	0	142	0	58	0	58	232
Florida State	60	54	0	114	71	118	0	189	0	134	0	134	437
U. of Minnesota	60	95	0	155	161	452	0	613	0	313	0	313	1,081
U. of Iowa	77	62	0	139	20	5	0	25	0	109	0	109	273
U. of Rochester	127	1,159	0	1,286	262	485	0	747	406	317	0	723	2,756
Notre Dame	0	52	0	52	0	44	184	228	0	0	814	814	1,094
Purdue	38	135	0	173	49	166	0	215	0	32	0	32	420
U. of Miss.	46	100	0	146	68	91	0	159	0	236	0	236	541
U. of Florida	44	95	0	139	184	412	0	596	117	29	0	146	881
Ohio State U.	140	64	0	204	275	212	0	487	0	0	0	0	691
Carnegie Mellon	0	113	0	113	0	291	0	291	0	0	0	0	404
Rice	138	19	0	157	102	56	0	158	111	5	0	116	431
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	197	2,592	0	2,789	8,443
U.C. Davis	34	100	0	134	0	78	0	78	0	16	0	16	228
UCLA	150	87	0	237	249	173	0	422	21	0	0	21	680
U.C. Riverside	20	10	0	30	0	164	0	164	0	0	0	0	194
John Hopkins	0	29	0	29	0	0	70	70	0	0	25	25	124
Northwestern	0	59	0	59	5	26	0	31	0	34	0	34	124
Rutgers	0	13	0	13	0	0	34	34	0	2	147	149	196
Princeton	0	256	0	256	0	626	0	626	0	980	0	980	1,862
Caltech	0	148	0	148	0	458	0	458	0	283	0	283	889
U.C. San Diego	11	0	0	11	11	90	24	125	0	0	0	0	136
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	290	290	3,660
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	2	237	239	363
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	26
MIT	0	37	0	37	15	67	0	82	0	0	0	0	119
Iowa State	0	0	0	0	0	0	19	19	0	3	0	3	22
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	852	10,468	1,515	12,835	48,451
Reserve	0	0	0	0	0	3,401	1,524	4,925	0	8,980	2,445	11,425	11,425
Total	1,568	9,382	0	10,950	1,974	22,073	5,544	29,591	852	19,448	3,960	24,260	59,876